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ABSTRACT

The institutions of the United States (and the developed world in general) are currently in a state of crisis. This is particularly true for educational institutions. As society shifts from an industrial era to a post-industrial, information era, the dominant world view is changing from one of segmentation and stasis to one that is holistic, synergistic, and dynamic, and in which the world is seen as constructed of interdependent systems. At present, one of the greatest sources of revolutionary change is occurring in the fields of computers, telecommunications, and information. However, at the same time that humans are becoming more globally interdependent, the information revolution is facilitating decentralization and diversification of society in the areas of work, education, and entertainment. Teachers must become aware of the full implications of the information revolution, and must ensure that everyone is given access. Further, educators must adapt their institutions to emphasize synthesis and to accept interdisciplinary study to a greater degree. Education must address the "whole" person, all the aspects of an individual's being, as well as the whole planet and our collective humanity. If traditional institutions do not adapt to the massive changes society is undergoing, then counterorganizations and institutions which are willing to experiment with new models and programs will arise to replace them. (KH)

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THE INFORMATION AND SYNERGETICS REVOLUTION:

IMPLICATIONS FOR EDUCATIONAL LEADERSHIP CHANGE

Linda J. Groff

Theses Concerning Education and Change

From A Futures Perspective

It is fashionable today to critique our educational institutions, and to offer various remedies, including a return to basics. A somewhat different tack is taken here. It uses a broad futurist approach to look at several of the major technological and societal trends impacting upon all our institutions today, including educational institutions. One objective is to better understand these changes, so that education can take a leadership role, rather than a reactive role, in responding to these changes. Another objective is to show that educational institutions are not alone today; indeed, all our institutions are in crisis, because of the onslaught of change sweeping the planet. Two overriding changes that are especially affecting education and all our institutions will be examined, i.e., the impact of the information revolution, and the impact of the new holistic/synergetic/systems world view (to be defined below). Also examined will be what it means to be living in a learning society today.

The thesis is that all the institutions in the United States and developed world are in crisis, as movement is made from an industrial to a post-industrial, information society, and as change occurs from a segmented, piecemeal, static view

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of reality to a holistic/synergetic/dynamic and interdependent systems world view (or overarching paradigm). Like all institutions, educational institutions are also in crisis today, as they scramble around trying to understand and adapt to the above two changes. These two changes will be examined in general and as they are specifically affecting our educational institutions today.

Another related hypothesis about change today will also be examined, as it affects all institutions in general, and as it affects educational institutions specifically. This hypothesis is that during any period of major change, such as that being experienced on the planet today, society always changes faster than institutions. Institutions are usually slow to change, as they often try to continue supporting an old order or value system because of their vested interests. However, when society changes, often due to the major restructuring effects of new technologies (such as computers and telecommunications), it creates new needs and demands. If the old, established institutions do not adapt to these technological and societal changes and initiate needed changes within their institutions, then new organizations and institutions will arise which are more in-tune with the times and willing to experiment with new policies, programs and actions. Some of these will work and some will not. Eventually, those that do work, and which are more adaptive to the times, will need to be absorbed by the traditional institutions or they will not survive.

Explored in greater depth will be what the above hypothesis means for traditional educational institutions, which clearly no longer have a monopoly on the function of education or learning in society. It will also be noted that other institutions in society are experiencing a similar loss of their former monopoly of control over their particular societal function or service. This is what tends to happen to all institutions (if they are unable or slow to adapt) in a period of rapid technological and societal change.

Finally, also examined will be the effects of the information revolution on education in general today, namely, that a learning society is being created and that lifetime learning is becoming the new norm. This has great implications for people's leisure time and for the knowledge and education business. The real question, however, is whether this function will be performed largely by traditional educational institutions or by a range of alternative types of learning centers or educational institutions?

The Computer/Telecommunications/Information Revolution and the Creation of a Post-Industrial, Information Society

A number of futurists seem to concur that society is in the midst of a massive computer/telecommunications/information revolution, which is totally restructuring society, the economy, jobs, and all other institutions.¹ Daniel Bell (1976) first talked about this in his book, The Coming of a Post-Industrial Society. A more recent book which helped to publicize this thesis and major societal shift to the mass

public was Alvin Toffler's (1980) The Third Wave. Basically, Toffler hypothesized that society has gone through three major waves or periods of change in human history, i.e.:

- ° An agricultural revolution, lasting thousands of years, in which people settled and then lived and worked on the land and grew food and agricultural products.
- ° An industrial revolution, lasting 200-300 years, in which people moved to the cities to work in factories, and in which manufactured goods were the primary products of society.
- ° An information revolution (what Toffler calls The Third Wave), fueled by the impacts of computer and telecommunication technologies, lasting 30-40 years, in which information (which is unlimited) is the new primary product, along with services of society. This information revolution is also creating what some people are calling the "learning society." Toffler says that we are in the midst of the information revolution now, and he does not know what will follow after that.

One thing is clear, however. The computer/telecommunications/information revolution (or whatever one wants to call it) is totally restructuring society and all other institutions. Institutions must adapt to the onslaught of all this change if they want to survive.

Toffler's book looks at a number of societal implications of this information or Third Wave society. Another book which also focuses on this same subject and which is also highly recommended is John Naisbitt's (1982) Megatrends: Ten New Directions Transforming our Lives and Yoneji Masuda's (1980), The Information Society as Post-Industrial Society.

There are several overriding effects of the computer/telecommunications/information revolution on society that are

quite dramatic and important, and that are affecting all our institutions.

One of the first effects is that the computer/telecommunications revolution is becoming, in effect, the nerves of the planet, linking everyone electronically and making everyone instantly aware of what is happening elsewhere in the world. In this sense, the world and its peoples are truly becoming more interdependent globally.

At the same time that humans are becoming more globally interdependent, the computer/telecommunications revolution is also creating an opposing trend as well, i.e., it is facilitating the decentralization and diversification of society's interests. In short, the industrial age created a mass-based society, with centralized institutions focused around the nation-state, in which there was mass production of goods, mass education of people, mass politics, mass media, etc. and in which everyone was treated the same, and this was considered democratic.

In contrast, the post-industrial information age is allowing society and its institutions to decentralize and its people to diversify their interests. People--with the aid of computers, telecommunications, video, cable, satellites--have the increasing opportunity to work at home if they choose (Toffler's electronic cottage), or to work in a centralized office (as in the past) and, likewise, to get an education at a traditional educational institution (as in the past) or at home via television, video, or computer.

In short, a multiple-option society is being created, with an explosion of information and media options--for work, education and entertainment. People increasingly can choose from various computer hardware/video technologies to get information from or do work; as well as choose increasing numbers of different computer software or video programs on ever more diverse topics to learn from.

While it used to be considered democratic to have everyone studying the same material in schools, seeing the same programs on television, and consuming the same mass-produced products, with the advent of the information age people increasingly are demanding diversity and the option to follow their own particular interests of the moment. Students also increasingly want to learn not only what they want, but at their own pace and in their own time schedule. Computers and telecommunications technologies can aid in this process. These expressed option clearly have enormous implications for education in general and for our traditional educational institutions in particular.

There are two other issues relating to the impact of the information revolution on education. The first issue is the crisis that education faces because of rising human and material costs (due to inflation) and decreasing budgets. Something is going to have to intervene to cut educational costs while still ensuring that needed, quality educational services are provided. It seems obvious that the most likely candidate to do this is a proliferation of computer hardware

(one of the few items coming down in price today), and increasingly user-friendly (easy to use) computer software. There also is a proliferation of high quality video learning packages (which can be shown on a television set via the aid of either cable, direct satellite broadcast, a videocassette recorder, or a videodisc player--all of which can be hooked to a television set either at a school/university or in one's home).

Such video products (which can capture the best teachers on video for everyone to see, and which are just beginning to invade the educational market), can be coupled with two-way interactive television such as Cube TV in Ohio so students can respond back to the material they see, or to a teacher or discussion leader who can be in a totally different location. These products promise to be an increasing wave of the future in education for various reasons: convenience of being able to learn from other places besides a centralized school, possibilities of high quality programs, and cheaper costs.

It has also been noted that, as computers increasingly take over rote learning, students will be permitted to learn at their own pace and teachers will have more time for quality interaction with students. It has also been shown that ghetto children, who have been turned off to learning, have been turned on again by computers which challenge everyone to "figure-out" their internal logic and which also treat everyone using them the same (i.e., computers do not discriminate).

For all of the above reasons, one can expect our traditional educational institutions--as indeed all our institutions today--to be fairly radically transformed via the effect of computer and telecommunications technologies, and the accompanying information explosion which they are making possible. At present, many teachers are not yet aware of the full implications of this information revolution, including its media (computer/telecommunications) component, which is likely to expand enormously in coming years.

Another crisis which teachers are facing is that, in many cases, children are adapting to the new technologies better and faster than adults, who are the teachers and who are the generation caught between the old ways of learning and the new ways. Children increasingly grow-up with video games, computers, etc., as a natural part of their environment (as telephone and television were for earlier generations), whereas for adults computers are often seen as foreign or threatening. Nonetheless, computer software is becoming more user-friendly and easier to use all the time.

When we talk about the goal of computer literacy for everyone, as a prerequisite to function effectively in a future (not too distant) society, this does not mean that everyone needs to learn how to write their own computer programs from scratch and become a computer programmer. It only means they need to be able to sit at a computer, type information into it (often in the form of simple answers to questions asked by the computer on a television screen, or monitor, in front of them).

Once voice-activated computers become perfected it may only mean they will have to be able to talk to a computer, to read information or their answers into a computer in response to questions asked them verbally by the computer. In short, it is becoming easier and easier to use a computer and this trend will continue.

A final issue concerning the impact of the information revolution is the importance of setting as a goal--both nationally and globally--that all people gain access to this explosion of information about all aspects of life, from the very micro, subatomic level, to the very macro astrophysics level and everything in between. This information is needed by people to further facilitate their own economic development and self-reliance, though within an increasingly interdependent and interconnected world.

The importance of everyone gaining access to information is because in an information society information is power (not wealth or resources as in the previous industrial age). Because information confers power and influence on people, many people are legitimately concerned that the information society will develop into those with access to information (the "haves") versus those without (the "have nots"). In a transition period, this seems to definitely be true, but it also underscores the very democratizing potential effect on society of the goal for everyone on the planet to have immediate access (via computer/telecommunications technologies) to whatever information they need at the moment (for their own

economic development, health, etc.) or to whatever information interests them at the moment. In this way, increasingly, everyone on the planet can learn about whatever they want or need to learn and also can connect them locally, regionally, nationally and globally with others having similar interests.³

If more and more people gain access to the information they need, get turned-on again to learning, then there could be the possibility (as Buckminster Fuller often said) of a "swift telecommunications revolution." This revolution could gain momentum quickly and help propel humankind into a new age and into a globally viable and interdependent civilization which is so desperately needed today.

So, while the computer/telecommunications/information revolution can be abused (as can any technology) and used to create new elites, it also has the potential to help liberate humankind in a fairly rapid way and help shift from crisis and breakdown to solution and breakthrough.⁴ If everyone becomes conscious that this more positive option also exists, then more and more people can commit their lives to helping this option be realized in their lifetime.

At the moment the clock is ticking on whether "spaceship earth" (to use Fuller's term) and humanity will survive and make it or not. The best guarantee that it will is if increasing numbers of people start committing their lives to trying to make the planet work for 100% of humanity. Surely, making needed information and positive options for the human

future available to all humanity is an important aspect of achieving this goal.

The Synergetics/Holistic/Systems Revolution

in World View and Thinking

Most educational institutions are generally aware of their need to understand the impact of computers (and less so telecommunications) on society and on education, and have begun at least initial explorations of this subject. There is another major change in our overarching paradigm or world view that is also occurring, which is just as important in its implications for society and for education. However, people in general, and our educational institutions in particular, are much less aware of it yet. This is the major shift from a segmented, static, one-point-in-time, compartmentalized world view (associated with Newtonian physics) to a more holistic, synergetic, dynamic or living systems perspective. This new perspective sees everything as constantly changing, interdependent, and part of an evolving whole system (associated with Einsteinian and Quantum physics, which are often referred to today as the "New Physics").⁵

The holistic health and consciousness movements, which are springing up widely in mass culture today are other examples of this new holistic worldview.⁶ So are ecological views of reality or dynamic systems models (such as the Club of Rome's computer models of dynamic systems, which show a number of interrelated variables within the global system evolving over time).⁷ Indeed, general systems theory and living systems

theory have emerged as whole new areas of study in recent years.⁸ The picture of the earth from space is another beautiful symbol of whole systems thinking on the global level--where the earth can be seen as a vibrant, interconnected, living system without national boundaries dividing it.⁹

The above examples of whole systems thinking mark a major shift in how we look at and experience reality. Toffler also refers to this as the shift from a primary focus on analysis--examining ever greater detail of ever smaller parts of the whole, thus losing the forest for the trees (the major world view during the industrial era) to a primary focus on synthesis--seeing the dynamic and evolving relationships between disparate information and parts of the whole, as well as the patterns emerging within systems, and within the massive information unleashed in this information revolution (the new paradigm or world view for the information age).¹⁰

When we look at our educational institutions today, we can readily see that they are not structured on a dynamic systems/holistic/synergetic world view. Instead, information is compartmentalized into different departments and disciplines, whose members often focus more on what separates them from their colleagues in other departments than on any underlying similarities of interest or overlapping interests. Nonetheless, some of the most interesting research and questions today are occurring in interdisciplinary areas where hypotheses are tested in more than one discipline and common patterns of living systems (no matter where they occur) are seen to emerge.

The computer revolution will help make it possible to study data from many diverse fields but academia will need to develop new learning modules which transcend traditional disciplines and take a whole systems perspective.

Suggested Areas for New Educational Policies & Initiatives

It is interesting that when one looks at education today there are several glaring inadequacies, in terms of what society and the world now need in order for all humanity to survive and prosper in coming years. A few examples follow:

- ° Today students largely study the past and the present, not the future--even though massive changes are occurring today which will forever change the world where all students will be living and working in the future.. (Indeed, most of the changes that futurists talk about are changes that are already occurring today, not at some far off future date.) Thus education, if it does not help students to understand these changes via future studies-type courses, is not adequately preparing students for their own futures.
- ° Students also get largely compartmentalized learning, of different subjects as separate parts of reality, with little effort at synthesis, leaving it up to them to try to determine how all these disparate subjects fit together. A responsible curriculum today would also include at least some interdisciplinary, whole systems courses.
- ° Education must also teach students that it is a globally interdependent world where vents elsewhere increasingly

impact upon lives here and vice versa. In a world increasingly linked via modern communications, trade, travel, economics, etc. a detached, uninformed or isolationist attitude toward world affairs will no longer suffice. Today the survival of each of us is tied to the survival of all and education should address itself to this fact.

- Clearly some minimum amount of computer literacy will be essential for people to function in their work, as well as home, environments in the future. Until voice-activated computers are perfected, this means that people will need to know how to enter information on a keyboard, i.e., they will need to know how to type.
- Despite the current availability of calculators (for math) and spelling dictionaries as software for use with computers (to check for correct spelling) and the eventual availability of voice-activated computers, this writer believes that education must continue to teach students at least minimal reading, writing, and math skills so that they can function adequately in the contemporary world and as a precondition for later self-directed learning by students.
- Some people also believe that education is too linear, left-brain, logical and rational without adequately developing right-brain capabilities (the source of creativity, spacial/artistic abilities and intuition).

Education should be balanced and develop all parts of the brain.

- ° Instead of compartmentalizing work and education, some people believe today that more combined work-study programs would greatly benefit students and give them a greater appreciation of the relationship between abstract ideas and their practical applications in the world of work and life in general.
- ° Education could also do more to give students, faculty, and community a stronger, more positive vision of the future and of the human potential. This vision would call people to their higher selves and empower them with a sense of community and world service, to help humanity through this great and dangerous but exciting transition period in world history--where we must build a truly global civilization that increasingly works for all humanity--if we all want to survive and prosper in this nuclear age and in the future.
- ° This may seem heretical to academia, but if we are going to learn to live together on this planet, then all the age-old conflicts and animosities between peoples will somehow have to be healed. This will require not only good ideas (on which people often differ) but also open and forgiving hearts. It will also require a recognition of our basic humanity (and common interest to survive) that unites us, as well as our unique differences, which if allowed to flower in positive ways can help everyone to

contribute in their own unique ways to making the planet work. Education needs to recognize that a whole person is also a loving person who feels connected to fellow human beings and to the planet. Education could do more to foster such universal attitudes and feelings of connectedness, responsibility, and concern for others.¹¹

What all the above educational suggestions are really saying is that education increasingly needs to address itself to the whole person, i.e., to all the aspects of a person's being (physical, emotional/heart, intellectual, and spiritual/intuitive), as well as to the whole planet and to our collective humanity, aspirations, oneness, and interconnectedness on this planet. The more everyone takes responsibility for healing old wounds and helping create a new world civilization that works for everyone, the greater the chance that this can occur.¹² We must all do our part locally to create a globally interdependent world that works. Anything short of that will not be enough to survive in the nuclear age. In short, our basic connectiveness--to other human beings, to all life, and to the planet--must be stressed increasingly by our educational institutions. This is part of whole systems thinking.

Can Our Traditional Educational Institutions Respond
to the Challenge of Change, or Will Alternative Organizations
and Institutions Arise to Meet the Challenge?

Having elaborated two major societal shifts affecting all our institutions--the information revolution and the

synergetics revolution--and having noted areas in which traditional education falls short of its potential to steer and direct change today, we will now look at the bottom-line question relating to our educational institutions today. In short, can our traditional educational institutions adapt to the above changes or will other organizations and institutions increasingly take over the new, innovative functions in education, thereby increasingly leaving our traditional educational institutions on the garbage heap of history? Educational institutions must comprehend the enormity of the technological and societal changes affecting them and take a leadership position in directing these changes and in preparing people for life in the latter part of the twentieth century and beginning of the twenty-first century.

To date it is fair to say that the traditional educational institutions are still largely resisting or reacting to the changes rather than leading the changes. In many ways, high technology companies are certainly out front in the technological component of this information revolution since they are producing this technology. Indeed, the computer/telecommunications field is extremely fluid and changing very rapidly today: New computer models hit the market every month and high technology in general changes every two to three years, putting great stresses on these companies and their employees. Since educational institutions are not on the cutting edge of this new technology today, one consequence is that corporations are creating their own learning centers to

train and keep their own employees abreast of all the technological, management, and other implications of this change. In the future, however, greater collaboration between high technology companies which have the technology, and educational institutions which educate our youth and adults will need to occur if society as a whole is to become computer literate.

Community learning centers and alternative educational programs and schools (which are also proliferating), are further examples of how traditional institutions are losing their former monopoly on the educational/learning component that any society requires. Media is another area that is just beginning to make inroads on traditional education. With the fast-paced development of computer hardware and software and video technologies, cable, and satellite, learning and education via various media packages are becoming an obvious trend, again increasing the options (in a multiple option, information society) of how individuals receive information and learn.

Whether traditional educational institutions will ever again regain the sole or primary responsibility in society for learning and education is clearly debatable. The trend is in the opposite direction at present. If educational institutions want to survive and be back on the cutting edge of change, they will have to: (1) incorporate these new technologies into their curriculum;¹³ (2) develop new learning packages, in terms of content which address all these technological and societal

changes and the need for whole systems thinking; and (3) also create a much wider range of educational programs (beyond traditional degree programs), including certificate programs and other shorter programs to update one's skills in a particular area.

The general principle at work is that if traditional institutions do not adapt to the massive changes society is undergoing, then counter organizations and institutions, which are willing to experiment with new models and programs, will arise.¹⁴ If successful, these new organizations will replace the traditional institutions (unless the latter later incorporate these changes).¹⁵ The future of our traditional educational institutions is open: What happens to them depends on how ready and creative they are to change.

Some Final Thoughts on the Learning Society and on Lifetime Learning

Due to the information revolution and accompanying explosion of technology and information (which becomes obsolete faster and faster, guaranteeing that an education will not last long in terms of the information learned), there is general agreement that we are becoming a "learning society" and that "lifetime learning" will become the new norm for everyone. People are also living longer,¹⁶ and the work week is expected to continue to shorten as society increasingly automates certain of its production functions with the aid of computers and robots, thereby creating more leisure time for people. One effect of this change is that people will increasingly have

more leisure time to pursue their particular interests of the moment--meaning education and learning will play a crucial role here.

Another interesting effect of longer lifetimes, the increasingly rapid pace of change and the impact of the computer/telecommunications/information revolution, is that most people have, according to various estimates, at least seven different jobs in their lifetime and three different careers or, according to another more recent estimate, up to eleven different jobs (Snyder, 1983). This means that everyone will have to be updated in any given field of work or retrained into whole new fields at various times throughout their life.

In the new information age it will be the unskilled workers who are worst off with fewer jobs available to them. These workers will need retraining which society and government and corporations have only begun to attempt.¹⁷ Again, this will be an important educational function for society, which some institutions will have to undertake.

The main concluding point to make is that education and learning are already big business in this country. Indeed, education is already the second largest industry in the United States (with health care and medicine being number one). By 1990 education is projected to be number one according to at least one futures forecaster (Snyder, 1983). The key question, however, is how involved or not our traditional educational institutions will be in this ongoing educational/learning

function required of a rapidly changing, learning society in an information and synergetics age.

FOOTNOTES

1. For this writer's summary of the literature on this subject see Groff, 1983.
2. For some speculations on what may follow the information revolution based on diverse futures literature and trends in different areas see Groff, 1983.
3. Jean-Jacques Servan-Schreiber, 1981. Also conversations with Mark Siegmund in Los Angeles, 1983, concerning his goals of taking the information revolution to the Third World.
4. I am indebted to Barbara Marx Hubbard (1982) for this evolutionary perspective on how to view crises as "evolutionary drivers," which can be converted from negative to positive triggers of change. For another good book with an evolutionary perspective see Russell, 1983.
5. For two excellent books which document the characteristics of this shift see Fritjob Capra's two books. The Tao of Physics; and The Turning Point. The former book examines the "New Physics" and its parallels to mystical views of reality which are also holistic. The latter book discusses the applications of the new dynamic systems paradigm from the "New Physics" to the other social sciences and medicine. Another good introduction to the "New Physics" is Zukav, 1979. —
6. For an excellent introduction to these movements and their underlying world view, as well as to new and parallel scientific worldviews see Ferguson, 1980.
7. See two of the most well-known and early global systems models and studies by the Club of Rome, namely: Donella H. Meadows, et al., 1972; and Mesarovic and Pestel, 1974. Key variables included in these global models are population, food, energy/resources, environmental pollution, technology, etc. For a brief summary of the literature on global modeling and some of the key global models available see The Tarrytown Letter (1982).
8. For the best overview and introduction to living systems theory with examples of its application in various areas, see Miller, 1978. See also the work of the Society for General Systems Research.

9. For a further discussion on this new whole systems perspective and examples of its application in various areas see Groff, 1983.

10. See Alvin Toffler, 1980.

11. Please note that this idea that everything in the universe is connected to everything else is fundamental to the "New Physics" view of reality, which has found that there is no such thing as a detached, objective observer. One's mere presence in an experiment or situation effects the results.

12. Please note that R. Buckminster Fuller, author of Utopia or Oblivion, Critical Path, Synergetics, and numerous other books, and creator of the geodesic dome and other inventions and designs, has documented via his World Game that there are enough resources by far to go around and to satisfy everyone's physical needs on the planet. The major problem, he claims, is that nation-states, which are obsolete, still operate based on the false assumption of scarcity and, therefore, conflict. A new win/win strategy globally (also necessary for the nuclear age), must, therefore, replace our old competitive win/lose strategies, based on conflict and scarcity. In a nuclear war no one wins, so for the first time in history it behooves us all to learn to live together on this planet. Whether we can learn to do this or not is the big test that humanity is collectively facing right now and it will determine whether this planet has a future or not. Surely education has a potentially crucial role to play in this process.

13. Computer literacy is obviously a prerequisite for survival in the future and students raised on television are also much more likely to learn if education is not only left-brained (as verbal, reading skills are), but also right-brained and visual, taking advantage of the proliferation of video technologies.

14. An interesting and parallel example today is traditional medical institutions (medical doctors, hospitals, and the AMA), which held a near monopoly in the medical/health area. However, their primary focus on treating disease once it has occurred, rather than preventing disease and promoting health and wellness (which are now important social movements of interest to many people, who increasingly want to take responsibility for their own health) means that an enormous wellness industry has arisen, based on holistic health, nutrition, healing, etc., which traditional doctors and medicine are only now beginning to consider.

15. A parallel and related example is third political parties, which have arisen in American politics in periods of change to advocate new issues or a new philosophy (when the two traditional political parties did not), only to have their ideas later absorbed by one or both of the traditional parties, once they realized the significance of such ideas. For a

further elaboration of how all our institutions are under stress and in crisis today as a result of the information and synergetics revolutions see Groff, 1983.

16. Several books which introduce this whole subject of life extension and reversing the aging process include: Kent, 1980; Kurtzman and Gordon 1976; Pearson and Shaw, 1982; and Walford, 1983.

17. So far one study shows that of automobile workers who have been laid off from work, most will not be rehired since they are being replaced by robots and automation. Only 3% of those laid off have found information-industry type jobs. The rest have found service sector jobs at lower pay than their previous jobs, indicating that not that much successful retraining of auto workers into more technical, skilled jobs has occurred (at least not yet).

BIBLIOGRAPHY

- Bell, D. The Coming of Post-Industrial Society: A Venture in Social Forecasting. New York: Basic Books, 1976.
- Capra, F. The Tao of Physics: On the Parallels Between Modern Physics and Eastern Mysticism. New York: Bantam Books, 1975.
- Capra, F. The Turning Point: Science, Society, and the Rising Culture. New York: Simon & Schuster, 1982.
- Ferguson, M. The Aquarian Conspiracy: Personal and Social Transformation in the 1980s. Los Angeles: J. P. Tarcher, 1980.
- Fuller, R. B. Utopia or Oblivion: The Prospects for Humanity. New York: Bantam Books, 1969.
- Fuller, R. B. In collaboration with Applewhite, E. J. Synergetics: Explorations in the Geometry of Thinking. With a preface and contribution by Arthur L. Loeb. New York: Macmillan Publishing Co., 1975.
- Fuller, R. B. With Kuromiya, Kiyoshi, and Adjuvant. Critical Path. New York: St. Martins Press, 1981.
- Groff, L. The post-industrial, information society: Societal trends and opportunities. Article in preparation, 1983.
- Groff, L. Institutions in crisis: Coping with change in an information and synergetics age. Article in preparation, 1983.
- Groff, L. Evolutionary and Transformation Futures. Book and article in preparation, 1983.
- Groff, L. Holistic/synergetic/systems thinking: Diverse examples of a new world view. Article in preparation, 1983.
- Hubbard, B. M. The Evolutionary Journey. San Francisco: Evolutionary Press, 1982.
- Kent, S. The Life Extension Revolution. New York: Morrow, 1980.
- Kurtzman, J. and Gordon, P. No More Dying: The Conquest of Aging and the Extension of Human Life. Los Angeles: J. P. Tarcher, 1976.

- Masuda, Y. The Information Society as Post-Industrial Society. Tokyo: Institute for the Information Society, 1980.
- Meadows, D. H., et al. The Limits to Growth. New York: New American Library, 1972.
- Mesarovic, M., and Pestel, E. Mankind at the Turning Point: The Second Report to the Club of Rome. New York: New American Library, 1974.
- Miller, J. G. Living Systems. New York: McGraw-Hill Book Co., 1978.
- Naisbitt, J. Megatrends: Ten New Directions Transforming Our Lives. New York: Warner Books, 1982.
- Pearson, D., and Shaw, S. Life Extension: A Practical Scientific Approach. New York: Warner Books, 1982.
- Russell, P. The Global Brain. Los Angeles: J. P. Tarcher, 1983.
- Servan-Schreiber, J-J. The World Challenge. New York: Simon & Schuster, 1981.
- Siegmund, M. Personal communication, 1983.
- Snyder, D. Presentation on Panel on "Labor, Life, Leisure: The Changing Role of Work in a Post-Industrial World." World Future Society Conference on "Working Now and in the Future," Washington D.C., August 12, 1983.
- The Tarrytown Letter (December, 1982). Issue on global modeling.
- Toffler, A. The Third Wave. New York: Bantam Books, 1980.
- Walford, R. Maximum Life Span. New York: W. W. Norton, 1983.
- Zukav, G. The Dancing Wu Li Masters: An Overview of the New Physics. New York: Bantam Books, 1979.